COST RECOVERY FOR MULTIPLE USE STORAGE RESOURCES

by
Lee Ewing

A capstone submitted to Johns Hopkins University in conformity with the requirements for the degree of Master of Science in Energy Policy and Climate

Baltimore, Maryland
May 2020

EXECUTIVE SUMMARY

My goal at the outset of this Capstone Project was to determine how electric storage resources ("ESRs") can be compensated for the services they can provide and whether ESRs can actually stack the value they offer in practice. To ascertain the answer to these questions, I conducted a review of relevant federal and state regulatory proceedings, decisions, and policies. What I discovered is that currently regulatory barriers prevent electric storage from monetizing all of the services that ESRs can provide, thereby preventing the technologies from delivering a full value stack. Starting from the premise espoused by the Federal Energy Regulatory Commission that the goal should be to realize the full capabilities of ESRs, I offer a path forward that would include the competitive procurement of ESRs through transmission planning and allowing the winning ESRs to also participate in energy markets in retain the resulting revenues. I reason that this path allows ESRs to realize their full capabilities and addresses the concerns raised by regulators that have so far prevented electric storage from monetizing its full value stack. My research and this paper were aided by foundational knowledge I gained through the courses in this program, including on electric storage technologies, policies, and economics in the Emerging Energy Technologies and Applications course and on energy and electric grid policies in the courses on the Electric Grid: Technology and Policy and Introduction to Energy Law & Policy. Finally, this paper is stylized as a law review article in keeping with the legal and policy nature of the project.

Table of Contents

TABLE OF ABBREVIATIONS AND ACRONYMS	
CAISO	California Independent System Operator Corporation
ConEd	Consolidated Edison Company of New York, Inc.
ConEd Utilities	Consolidated Edison Company of New York, Inc. and Orange and Rockland Utilities, Inc.
CPUC	California Public Utilities Commission
ESR(s)	Electric Storage Resource(s)
FERC	Federal Energy Regulatory Commission
kW	Kilowatts
MISO	Midcontinent Independent Transmission System Operator, Inc.
MW	Megawatt
MWh	Megawatt-hour
New York ISO	New York Independent System Operator, Inc.
PG&E	Pacific Gas & Electric Company
PSC	Public Service Commission
PUCT	Public Utility Commission of Texas
REV	Reforming the Energy Vision
RFP(s)	Requests for Proposal(s)
RTOs/ISOs	Regional Transmission Organizations and Independent System Operators
SATA	Storage as a Transmission Asset
SCE	Southern California Edison
SPP	Southwest Power Pool

I. INTRODUCTION

Electric storage resources ("ESRs") have been broadly recognized to offer a variety of benefits, all of which must be utilized to maximize the utility of the particular device. This concept is known as the value stack. Unique among grid-related assets, electric storage can act as a generator (by producing energy), consumer (by consuming energy), or as a transmission or distribution provider (by deferring traditional wire transmission or distribution projects and supporting electric grid reliability). However, monetization of the value provided for each of these roles takes a different form depending on the service rendered. For example, consumers and generators can buy and sell electricity and related products into the markets administered by regional transmission organizations and independent system operators ("RTOs/ISOs") under the oversight Federal Energy Regulatory Commission ("FERC"). Transmission and distribution providers are traditionally compensated through traditional cost-of-service rates or rates based on some other appropriate methodology. "Multiple use" or "multi-use" refers to the ability of the ESR to monetize the value stack from both market services and transmission and distribution services and is the focus of this paper.[1]

Unlocking the multi-use capabilities of electric storage is critical as studies have indicated that the transmission/distribution attributes represent roughly 30%-70% of the value of ESRs.[2] As FERC has stated, "[e]nabling electric storage resources to provide multiple services

---

1 This paper will address front-of-the-meter, grid scale electricity storage, rather than customer-sited ESRs located behind-the-meter. The value proposition presented by behind-the-meter energy storage is particular to the customer (e.g., decreasing billing determinants or providing backup power) and, as such, the analysis in this paper would have limited applicability to those systems.

2 Ian Oxenham, *Charging Onwards: Removing Barriers to Energy Storage in Restructured New England States*, 43 Vt. L. Rev. 575, 587 (2019).

(including both cost-based and market-based services) ensures that the full capabilities of these resources can be realized, thereby maximizing their efficiency and value for the system and to consumers."[3] However, FERC has also recognized the need for protecting customers when determining how ESRs may be compensated, such that ESRs should not be allowed to recover twice for providing the same service. In other words, cost recovery for multi-use ESRs must be designed to prevent over- or double recovery.

To strike this balance between protecting consumers and realizing the full capabilities of electric storage, including distribution and transmission services, this paper advocates a shift from the traditional transmission and distribution cost-of-service paradigm, whereby the utility is allowed to recover the entire cost of its transmission and distribution services in its regulated cost-based rate. Instead, this paper argues that competitive procurement of transmission and distribution services, such as under FERC Order No. 1000, together with access to market revenues for ESR owners, offers an efficient and cost-effective path forward for multi-use ESRs. Allowing these ESRs to retain market revenues will allow bidders to propose transmission and distribution solutions at a reduced cost and will place the risk of market revenue under-recovery on the ESR owner, rather than customers, even if only partial cost recovery is achieved. Competitively established costs for the transmission and distribution services of ESRs will yield an appropriately priced solution and alleviate the need to adopt additional measures to prevent double recovery.

This paper will review FERC and state utility commission decisions on multi-use ESRs, lay out the lessons learned from these proceedings, and suggest a path forward for monetizing

[3] *Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery*, Policy Statement, 158 FERC ¶ 61,051 (2017).

the ESR value stack, focusing, in particular, on incorporating multi-use ESRs into the transmission planning process of the California Independent System Operator Corporation ("CAISO"). The focus of this paper is determining the appropriate ratemaking methodology for multi-use ESRs to recover all or a portion of the costs of transmission and distribution services they provide, recognizing that they will also receive market revenues. The ultimate conclusion reached by this paper synthesizes FERC policies, including transmission policies established by FERC Order No. 1000, with the state approaches.

II. OVERVIEW OF THE SERVICES PROVIDED BY ELECTRIC STORAGE

a. The Electric Grid, Regulation, and Markets

The traditional paradigm has been that, unlike other commodities, electricity must be consumed simultaneously with production.[4] This is the fundamental limitation upon which the electric grid has been constructed. At the three primary stages of electricity supply, represented in Figure 1 below, the electrons are first produced by generation, then carried over long distances by the high-voltage transmission network, and ultimately delivered to the consumer by the low-voltage distribution network.[5] Although seemingly simple at a high level, the details of maintaining a constant balance of supply and demand quickly complicate electric grid operations. For example, the capacity of transmission and distribution lines limits the paths that electrons can follow and makes delivery into certain constrained areas more expensive than

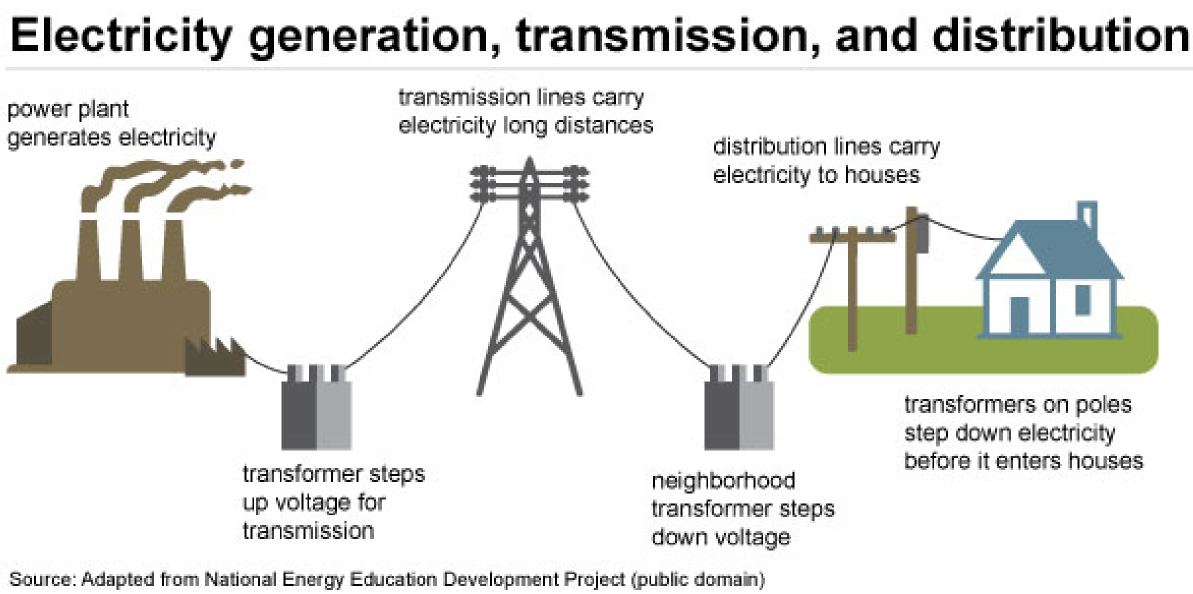
---

4 *See* Kevin B. Jones, et al., *The Electric Battery: Charging Forward to a Low-Carbon Future*, 9 (2017) (explaining that the electric "grid still relies on constant generation that is responsive to demand and available at the precise moment of that demand.").

5 Jeremy Lin & Fernando H. Magnago, *Electricity Markets: Theories and Applications*, at 2 (1st ed. 2017)

others.[6] Further, as supply must match demand, grid operators must manage a portfolio of generation with varying characteristics, including base load resources with limited ramping capability (e.g., coal and nuclear), variable renewable generators (e.g., wind and solar), and flexible ramping resources (e.g., natural gas combined-cycle and hydro).[7]

FIGURE 1[8]



The regulation of this complex system of electric generation, transmission, and distribution is split between the FERC at the national level and various utility commissions at the individual state level.[9] FERC has jurisdiction over the rates and terms and conditions for

---

6 Sydney P. Forrester, et al., *Policy and market barriers to energy storage providing multiple service*, The Electricity Journal 30, 51 (2017); David Schmitt & Glenn M. Sanford, *Energy Storage: Can we Get it Right?*, 39 Energy L.J. 447. 473 (2018).

7 Allen J. Wood & Bruce F. Wollenberg, *Power Generation, Operation, and Control* (2d ed. 1996); Alexandra B. Klass, *Expanding the U.S. Electric Transmission and Distribution Grid to Meet Deep Decarbonization Goals*, 47 Envtl. L. Rep. News & Analysis 10749, 10754 (2017); Alexandra B. Klass, *Future-Proofing Energy Transport Law*, 94 Wash. U. L. Rev. 827, 848-49 (2017).

8 U.S. Energy Information Administration, *Electricity explained*, available at: https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php (last visited Apr. 26, 2020).

9 Amy L. Stein, *Regulating Reliability*, 54 Hous. L. Rev. 1119, 1199 (2017).

transmitting electricity in interstate commerce *(i.e.*, the transmission network) and the sale in interstate commerce of electricity for resale (*i.e.*, wholesale sales).[10] States regulate retail sales, the distribution network, and the siting and permitting of transmission and sometimes distribution facilities.[11] State commissions are also frequently responsible for implementing the energy policies of the states.

Up until the late 20th century, electricity was provided throughout the country by vertically-integrity utilities that held monopoly ownership over the entire supply chain of the electricity commodity.[12] These utilities were compensated for the service they provided through cost-of-service-rates, formulated to allow utilities to recover their revenue requirement.[13] Put simply, the cost-based revenue requirement is calculated by summing the utilities' operating expenses, taxes, depreciation, and the return on capital investments.[14] The return on capital investments is the utilities' total capital expenditures (referred to as the "rate base") minus depreciation multiplied by an allowed rate of return.[15] Cost-based rates are administratively established by FERC or state commissions, depending on the nature of the service as wholesale or retail, and are statutorily required to be "just and reasonable."[16]

In an effort to foster competition and benefit from competitively established supply prices, many states in the late 1990s deregulated energy generation and directed utilities to divest

---

10 16 U.S.C. § 824(b)(1), (f).

11 Jim Lazar, *Electricity Regulation in the US: A Guide*, 14-15 (2d. 2016), available at: https://www.raponline.org/wp-content/uploads/2016/07/rap-lazar-electricity-regulation-US-june-2016.pdf.

12 Oxenham, *supra* note 2, at 589.

13 Lazar, *supra* note 10, at 49.

14 *Id*.

15 *Id*.

16 16 U.S.C. § 824d.

themselves of these assets.[17] Between 1996 to 2000, 24 states at least partially deregulated electricity supply, but this momentum towards market "restructuring" stalled after the California energy crisis in 2000-01.[18] Competitive electricity supply was also aided by the formation of RTOs/ISOs, at FERC's behest, which facilitated competitive and dynamic energy markets in regions no longer dominated by vertically-integrated utilities.[19] Each RTO/ISO market is distinct, but they can consist of separate markets for energy, capacity, and ancillary services, which are described in more detail below.[20]

b. Description of Electric Storage Technologies and Their Benefits

Electric storage has become increasingly relevant in recent years because of the declining costs of certain technologies and ESRs' theoretical ability to complement variable renewable energy generation resources.[21] FERC defines an ESR asset as "a resource capable of receiving electric energy from the grid and storing it for later injection of electricity back to the grid regardless of where the resource is located on the electrical system."[22] This seemingly simple definition belies the complex problems presented by emerging electric storage technologies,

[17] Scott Hempling, *Regulating Public Utility Performance: The Law of Market Structure, Pricing and Jurisdiction* 393 (2013); Lazar, *supra* note 11, at 10, 90 (showing cartographically which states have and have not restructured).

[18] John S. Moot, *Economic Theories of Regulation and Electricity Restructuring*, 25 Energy L.J. 273, 286 (2004).

[19] Jonas J. Monast, *Electricity Competition and the Public Good: Rethinking Markets and Monopolies*, 90 U. COLO. L. REV. 667, 67-78 (2019).

[20] *See, e.g.*, ISO New England, Inc., *Administering the Wholesale Electricity Markets*, available at: https://www.iso-ne.com/about/what-we-do/three-roles/administering-markets (last viewed May 2, 2020) (describing the markets administered by ISO New England, Inc.).

[21] Schmitt & Sanford, *supra* note 6, at 457.

[22] *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators, Notice of Proposed Rulemaking*, FERC Stats. & Regs. ¶ 32,718, at P 10 (2016).

particularly in the context of a traditional electric grid based on technologies that fit distinctly a generation, transmission, or distribution classification.[23]

Although it is common to refer to electric storage in a general sense, this term includes a broad range of diverse technologies that offer distinct capabilities. Historically, the most widespread ESR technology from a capacity basis has been hydroelectric pumped storage.[24] As its name implies, pumped hydro stores potential kinetic energy by pumping water up to an elevated retaining pool and then, when power is in demand, releasing that water down through a turbine.[25] Like other forms of gravitational storage, pumped hydro is capital intensive, but also provides relatively high capacity values and long discharge durations.[26]

Lithium-ion batteries are currently the most popular form of new ESRs due to their declining costs.[27] A form of chemical electric storage, lithium-ion batteries typically have discharge durations of around four hours and fast response times.[28] Flywheels are another electric storage technology that is already widely employed to provide grid support.[29] Flywheels store kinetic energy by using electrical energy to drive a motor that spins a mechanical device to increase rotational speed.[30] These ESRs have short discharge durations, but have fast response

---

23 *Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery, Policy Statement*, 158 FERC ¶ 61,051, at P 2 (2017) ("*FERC Policy Statement*").

24 Krista Hughes & Stacey Simone Garfinkle, *Planning for a Rainy Day: The Future of Energy Storage and the Policies Driving Its Growth*, 32-SPG Nat. Resources & Env't 31, 33 (2018)

25 *Id*.

26 K&L Gates LLP, *Energy Storage Handbook*, 7-8 (November 2019)

27 Schmitt & Sanford, *supra* note 6, at 457.

28 Environmental and Energy Study Institute, *Fact Sheet: Energy Storage (2019)* (Feb. 22, 2019), available at: https://www.eesi.org/papers/view/energy-storage-2019.

29 Richard L. Revesz & Burcin Unel, *Managing the Future of the Electricity Grid: Energy Storage and Greenhouse Gas Emissions*, 42 Harv. Envtl. L. Rev. 139, 152-53 (2018).

30 K&L Gates LLP, *supra* note 26, at 7.

and ramp rates, making them an effective provider of certain ancillary services such as frequency response.[31] There are numerous other forms of ESRs, including, in part, flow batteries, compressed air, fuel cells, and thermal energy storage, but the above examples demonstrate the diversity of services these technologies can provide.[32]

The benefits offered by ESRs are possibly as diverse as the technologies themselves. From a public policy perspective, the principal value of ESRs is their ability to complement variable renewable energy, such as solar and wind, and thereby reduce the dependence on carbon emitting fossil fuel electric generation technologies.[33] As explained above, the grid was built around the simultaneous production and consumption of electricity. However, ESRs are able to store electricity that is produced at one time to meet demand at a later time. Because production from variable renewable energy is dependent on intermittent resources, *e.g.*, when the wind blows or sun shines, ESRs can complement these generators by releasing stored energy on cloudy or windless days, or temporally shifting excess production to meet demand arising later in time.[34]

---

[31] *Id*.

[32] *Id*. at 8-9.

[33] Klass, *supra* note 7, at 10754. While intuitive, the ability of ESR to actually displace fossil fuel-based generation depends on how ESRs are deployed. In certain cases, increased ESR deployment can actually cause an increase in emissions by allowing baseload power plants, such as coal generators, to meet a higher proportion of demand when variability is stabilized. Revesz & Unel, *supra* note 29, at 157.

[34] In California, a high penetration of solar created the infamous "duck curve", which is the visual description of the daily demand curve, net of solar. Julie Blunden, *The Case for Long-Duration Storage: Net Electricity Load in Calif. Is 5 Years Ahead of Schedule*, Greentech Media (2015), available at: https://www.greentechmedia.com/articles/read/california-is-already-hitting-its-2020-duck-curve#gs.OTk4Lvk. As solar generation ebbs late in the day when many people were returning home and increasing electricity usage in their homes, the demand curve increases steeply, necessitating more high-ramping generation, such as natural-gas fired power. *Id*. ESRs would be well positioned to address the increased net demand that causes this duck curve by consuming electricity at high solar production periods and selling electricity when solar production declines.

ESRs' participation in electric markets as both supply and demand also enables these resources to arbitrage electric prices by charging when demand and prices are low and discharging when demand and prices are high.[35] As ESRs proliferate and increase participation in electric markets, their influence on supply and demand will result in more stable electric prices for consumers.[36] Relatedly, electric storage's ability to meet demand spikes (i.e., "peak" demand) also displaces the significant capital-intensive infrastructure necessary to address these temporary anomalies in consumption patterns.[37] This displaced infrastructure is dominated by natural gas-fired "peaker plants" that exist almost exclusively to meet peak demand.[38]

ESRs can also allow the utility to defer investments in transmission and distribution infrastructure needed to meet increased electricity demand.[39] Transmission and distribution networks have limited capacity, which can become constrained as electricity demand spikes or increases over time.[40] An ESR built downstream from a transmission or distribution constraint can provide relief by charging during periods when the system is unconstrained and discharge when a constraint arises.[41] Such an ESR can defer network upgrades and prolong the useful life of the system.[42]

---

35 Schmitt & Sanford, *supra* note 6, at 467.

36 *Id*.

37 *Id*. at 469.

38 Krista Hughes & Stacey Simone Garfinkle, *Planning for a Rainy Day: The Future of Energy Storage and the Policies Driving Its Growth*, 32-SPG Nat. Resources & Env't 31, 32 (2018); Peter Maloney, *Nearly 1/3 of planned gas peakers at risk from energy storage, GTM finds*, Utility Dive (March 20, 2018), available at: https://www.utilitydive.com/news/nearly-13-of-planned-gas-peakers-at-risk-from-energy-storage-gtm-finds/519577/.

39 Garrett Fitzgerald, et al., *The Economics of Battery Energy Storage*, Rocky Mountain Institute, 15 (2015).

40 *Id*.

41 C. Baird Brown, *Financing at the Grid Edge*, 48 Envtl. L. Rep. News & Analysis 10785, 10788 (2018).

42 Schmitt & Sanford, *supra* note 6, at 460.

Perhaps even more so than conventional generation, ESRs are adept at providing ancillary services, which are "[t]hose services that are necessary to support the transmission of capacity and energy from resources to loads while maintaining reliable operation of the Transmission Service Provider's transmission system in accordance with good utility practice."[43] Ancillary services include both market services, such as frequency regulation, and cost-based services, including reactive supply and voltage control.[44] Finally, ESRs can bolster general system reliability by relieving overloaded grids, mitigating weather related outages, and providing black start services.[45]

c. Monetizing the Value Stack

Although ESRs potentially offer a diverse array of benefits, not all of the services that ESRs can provide are currently monetizable, particularly for a single resource that provides a number of different services. Many of the services that ESRs can provide can be grouped into two general categories: market services and grid services.[46] As explained above, market services refer to the energy, capacity, and ancillary services markets administered by RTOs/ISOs.[47] Grid

---

43 North. Am. Elec. Reliability Corp., *Glossary of Terms Used in NERC Reliability Standards* (2020), available at: https://www.nerc.com/files/glossary_of_terms.pdf.

44 Schmitt & Sanford, *supra* note 6, at 460; Fitzgerald, supra note 40, at 15.

45 Schmitt & Sanford, *supra* note 6, at 467 ("black start services are used 'to energize transmission and distribution lines and provide station power to bring power plants on line after a catastrophic failure of the grid.'") (*quoting* Abbas A. Akhil et al., DOE/EPRI Electricity Storage Handbook in Collaboration with NRECA, Sandia National Lab, 10 (July 2013).

46 A third value that potentially can be stacked are customer services, which are the bill-management and incentive program values provided by a customer-sited, behind-the-meter ESRs, including reduced demand charges, time-of-use management, and back-up power. Firtzgerald, *supra* note 39, at 5. However, these services are outside the scope of this paper, which focuses on front-of-the-meter, utility-scale ESRs.

47 Firtzgerald, *supra* note 39, at 15.

services are traditionally cost-based transmission and distribution services, such as reliability and congestion relief.[48]

In the market, the most obvious source of revenue for ESRs is through energy arbitrage – buying power when the price is low and selling power when the price is high.[49] Energy storage could also receive revenue from capacity markets, in regions where such markets exist, by committing to meet projected future demand for a delivery year one to three years into the future, depending on the particular RTO/ISO construct.[50] The ability to quickly charge and discharge means that ESRs are also well equipped to meet the demand for many ancillary services; these markets have historically been the primary source of revenue for many electric storage technologies.[51] However, the demand for ancillary services is limited and finite, resulting in increasingly undependable market revenue as ESRs proliferate.[52]

Unlike for energy, capacity, and certain ancillary services that storage could provide, there is currently no market for transmission and distribution services. This is significant because, as the Brattle Group found, "30-40% of the total system-wide benefits of storage investments are associated with reliability, transmission, and distribution functions that are not reflected in wholesale market prices and, thereof, cannot be captured by merchant storage investors."[53] Consequently, the inability for ESRs to receive revenue for transmission and

---

48 *Id*. at 5.

49 Forrester, *supra* note 6, at 51.

50 *Id*.

51 Derek Sackler, *New battery storage on shaky ground in ancillary service markets*, Utility Dive (Nov. 14, 2019), available at: https://www.utilitydive.com/news/new-battery-storage-on-shaky-ground-in-ancillary-service-markets/567303/.

52 *Id*.

53 Judy Chang, et al., *The Value of Distributed Electricity Storage in Texas*, The Brattle Group, 2 (November 2014), available at: https://brattlefiles.blob.core.windows.net/system/news/pdfs/000/000/749/original/the_value_of_distributed_electricity_storage_in_texas.pdf.

distribution services, along with compensation for market services, prevents ESRs from reaching their full capabilities and is inefficient from an economic perspective.

However, enabling ESRs to receive revenue for multiple services presents a challenge for regulators that are wedded to the idea that the entire cost of transmission and distribution assets must be recoverable through cost-of-service rates. As explained in more detail below, introducing market revenues raises a number of issues that the traditional cost-of-service model is ill-equipped to handle, including the potential for being compensated twice for the same service (*i.e.*, "double recovery") and determining when an ESR should provide each service. As explained in the following sections, first in regards to FERC and then state commissions, ESRs are not realizing their full capabilities under the current regulatory structures, but the situation is evolving. Establishing consistent sources of revenue for the full value stack is vital to enable ESRs to unlock investment opportunities.[54]

III. ELECTRIC STORAGE AS A TRANSMISSION ASSET AND MARKET PARTICIPANT

FERC has issued storage policies and directives that address the participation of electric storage in both transmission planning and ISO/RTO markets. In response, several RTOs/ISOs have made efforts to adapt their existing market rules and transmission policies to accommodate ESRs. Most notably, CAISO, the Midcontinent Independent Transmission System Operator, Inc. ("MISO"), and the Southwest Power Pool ("SPP") are exploring reforms for storage as a transmission asset ("SATA").

54 Schmitt & Sanford, *supra* note 6, at 488.

a. *Federal Energy Regulatory Commission*

i. Transmission

FERC has required RTOs/ISOs to consider non-wire alternatives, which can include ESRs, in transmission planning since it issued FERC Order Nos. 890 and 1000.[55] Through these orders, FERC adopted several significant measures to reform transmission planning. One such measure was to "require the comparable consideration of transmission and non-transmission alternatives in the regional transmission planning process."[56] FERC Order No. 1000 also requires transmission planners to consider public policy requirements established under state and federal law and non-transmission alternatives in transmission planning.[57] However, FERC did "not establish minimum requirements governing which non-transmission alternatives should be considered or the appropriate metrics to measure non-transmission alternatives against transmission alternatives."[58] Further, FERC explicitly declined to address cost allocation for non-transmission alternatives.[59]

Although Order No. 1000 does not specifically mention electric storage, FERC did approve cost-based recovery for battery ESRs through transmission rates in *Western Grid Dev. LLC*, 130 FERC ¶ 61,056, *reh'g denied* 133 FERC ¶ 61,029 (2010) ("*Western Grid*"). The battery storage was to provide transmission service to solve existing reliability problems on the

---

55 Order No. 890, *Preventing Undue Discrimination and Preference in Transmission Service*, 72 Fed. Reg. 12,266 (2007); Order No. 1000, *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, 136 F.E.R.C. ¶ 61,051, 76 Fed. Reg. 49,842 (2011) ("Order No. 1000").

56 Order No. 1000 at P 155.

57 *Id*. at P 203.

58 *Id*. at P 155.

59 *Id*. At P 779. Cost allocation deals with assigning responsibility for recoverable utility costs among ratepayers. Jim Lazer, *Dividing the Pie: Cost Allocation, the First Step in the Rate Design Process*, Regulatory Assistance Project, available at: https://www.raponline.org/wp-content/uploads/2016/05/appendix-a-smart-rate-design-2015-aug-31.pdf (last viewed Apr. 27, 2020).

CAISO grid, at a lower cost than traditional transmission upgrades.[60] The proposal approved by FERC included a commitment to forego any sales into the wholesale energy markets, and FERC noted that the ESRs would "not be bid into the CAISO markets or be market participants in any way."[61] Based on the specific circumstances and characteristics of the proposal, the Commission found that that the battery projects were wholesale transmission facilities subject to its jurisdiction.[62] For obvious reasons, *Western Grid* is somewhat unsatisfying because its facts did not require that FERC address the critical issue of how the Commission would deal with a multi-function storage project that provides both transmission services and also bids stored energy into the energy or ancillary markets.

ii. Market

The participation of ESRs in markets was addressed most prominently in FERC's recent Order No. 841, which sought to remove barriers for electric storage participation in wholesale capacity, energy, and ancillary services markets.[63] Order No. 841 directed RTOs/ISOs to revise their tariffs to develop a participation model that better incorporates electric storage into the market, including implementing processes that accommodate the physical and operational characteristics of electric storage systems.[64] Specifically, Order No. 841 included the following requirements for each RTO's/ISO's participation model: allow electric storage resources to be eligible to participate in all capacity, energy, and ancillary services markets that the resource is

---

60 *Western Grid* at P 3.

61 *Id.* at P 50.

62 *Id*. at PP 43, 56.

63 *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 841, 162 FERC ¶ 61,127 (2018) ("*Order No. 841*"), *order on reh'g*, Order No. 841-A, 167 FERC ¶ 61,154 (2019).

64 *Order No. 841* at P 3.

technically capable of providing; ensure that storage resources under the participation model can be dispatched and establish the wholesale market clearing price as a wholesale seller and/or buyer; account for electric storage's physical and operational characteristics (via bidding parameters or other means); and set a minimum size requirement for storage resources' participation in the RTO/ISO markets of not more than 100 kilowatts ("kW").[65]

iii. Multiple Use ESRs

While FERC has provided a clear mandate that ESRs should be able to participate in both market and transmission planning to the extent they are technically able and/or cost effective, FERC has not established definitive rules for multi-use ESRs. FERC has, however, issued a Policy Statement on January 19, 2017 to provide guidance on ESRs receiving both cost-based recovery for transmission services and market-based revenue for energy and ancillary services.[66] FERC felt the need to reconcile its decision in *Western Grid* with *The Nev. Hydro Co., Inc.*, 122 FERC ¶ 61,272 (2008) ("*Nevada Hydro*"), in which FERC denied a proposal that would designate a pumped hydro ESR as a transmission facility and to recover its costs through transmission rates.[67] Under the Nevada Hydro proposal, CAISO would take operational control of the pumped hydro ESR, allowing the ESR to serve a variety of ancillary service needs for the CAISO market, and Nevada Hydro would consistently bid the ESR's stored energy into the CAISO market at zero.[68] CAISO opposed this proposal, arguing that its independence as the

---

[65] *Id*. at P 4.

[66] *Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery*, Policy Statement, 158 FERC ¶ 61,051 (2017) ("*FERC Policy Statement*").

[67] *Id*. at PP 1, 3.

[68] *Nevada Hydro* at P 74.

market administrator would be compromised.[69] FERC found that the purpose of CAISO's transmission rates was to recover the costs of transmission facilities under CAISO's control, not as compensation for what FERC referred to as "bundled services."[70] Further, according to FERC, allowing the pumped hydro ESR to receive a guaranteed revenue stream through transmission rates would create an undue preference for the pumped hydro ESR compared to other similarly situated pumped hydro generators.[71]

In the Policy Statement, FERC confirmed that “there may be approaches different from Western Grid’s approach under which an electric storage resource may receive cost-based rate recovery and, if technically capable, provide market-based services that may address [FERC’s] concerns.”[72] FERC rejected claims that allowing market and cost-based recovery will adversely impact other market competitors.[73] However, FERC explained that the following issues must be addressed before multi-use ESRs are permitted:

> (1) the potential for combined cost-based and market-based rate recovery to result in double recovery of costs by the electric storage resource owner or operator to the detriment of cost-based ratepayers; (2) the potential for cost recovery through cost-based rates to inappropriately suppress competitive prices in the wholesale electric markets to the detriment of other competitors who do not receive such cost-based rate recovery; and (3) the level of control in the operation of an electric storage resource by an RTO/ISO that could jeopardize its independence from market participants.[74]

---

69 *Id*. at P 83.

70 *Id*. at P 62.

71 *Id*. at P 83.

72 *FERC Policy Statement* at P 9.

73 *Id*. at P 21.

74 *Id*. at P 13.

To address the potential for double-recovery, FERC provided several potential options, including 1) recovering the full costs of the ESR through cost-based rates and crediting all market revenues back to customers, and 2) recovering part of the costs of the ESR and crediting part of the market revenues back to customers.[75] Further, to ensure the independence of the RTO/ISO, "the provision of market-based rate services should be under the control of the electric storage resource owner or operator, rather than the RTO/ISO."[76] Finally, for multi-use ESRs, the provision of transmission services should receive priority over the provision of market services.[77]

b. RTOs/ISOs

In response to the FERC Policy Statement, CAISO initiated a stakeholder proceeding to evaluate "the circumstances and conditions when storage facilities [CAISO] finds through the transmission planning process to be needed to provide a reliability service can also provide market-based services."[78] In its second straw proposal issued on October 16, 2018, CAISO again indicated a willingness to consider electric storage whose purpose is to meet transmission needs.[79] CAISO offered four potential cost recovery options for storage that provides both transmission and market services:

---

75 *Id*. at PP 17-18.

76 *Id*. at P 19.

77 *Id*. at P 26.

78 California Independent System Operator, Inc., *Storage as a Transmission Asset: Enabling storage assets providing regulated cost-of-service-based transmission service to access market revenues*, 9 (2nd Revised Straw Proposal, Oct. 16, 2018) ("*CAISO Straw Proposal*").

79 *Id*. at 12. In particular, CAISO noted, however, that "the majority of the economic benefits for storage projects appear to occur when acting as resources competing against other market resources." *Id*. CAISO also proposed to provide a SATA notification to indicate to SATA resource owners when a SATA resource will be permitted to participate in the market. *Id*. at 7.

1. Full cost-of-service based cost recovery with complete energy market crediting back to ratepayer;[80]
2. Partial cost-of-service based cost recovery and retain energy market revenues;[81]
3. Full cost-of-service recovery with partial market revenue sharing between owner and ratepayer;[82] and
4. Partial cost-of-service recovery with partial market revenue sharing between owner and ratepayer.[83]

Referring to option one, CAISO acknowledged that "[t]he most significant challenge with this model is that it provides little incentive for the [ESR] to participate in the market."[84] To address this challenge, CAISO is considering imposing a "must offer obligation" to force SATA resources to participate in the market when they are permitted to do so (*i.e.*, when they are not providing transmission services).[85] CAISO also explained that a drawback for option two is the need to forecast market revenues to establish a partial cost-of-service rate, along with the risk that those revenues will not ultimately be realized.[86] The third option is designed to provide incentives for market participation not present in the full cost-of-service option, while mitigating

---

[80] *Id*. at 19-21.

[81] *Id*. at 21-23.

[82] *Id*. at 23-25. CAISO present two options for splitting market revenue: "The first option is simply that any market revenues would be split, the second option is that the resource would have to first surpass a given amount of market revenues before it would be permitted to retain some portion of market revenues." *Id*. at 24.

[83] This option was added in a CAISO presentation of its second straw proposal. Karl Meeusen, *Storage as a Transmission Asset: Enabling storage assets providing regulated cost-of-service-based transmission service to access market revenues*, California Independent System Operator, Inc., 8 (Jan. 14, 2019), available at: http://www.caiso.com/InitiativeDocuments/Presentation-Storage-TransmissionAsset-Jan142019.pdf.

[84] *CAISO Straw Proposal* at 21.

[85] *Id*.

[86] *Id*. at 22.

some of the financial uncertainties that exist in the partial cost of service approach.[87] CAISO suspended its SATA initiative pending the outcome of a related distributed energy resource proceeding and expects to resume the SATA initiative in the second half of 2020.[88]

Perhaps unsurprisingly considering the only two FERC SATA cases, *Western* and *Nevada Hydro*, emanated from the CAISO region, the other RTOs/ISOs are generally well behind CAISO in considering multi-use ESRs. MISO is the only RTO/ISO to actually submit a SATA tariff proposal to FERC, but that proposal is for SATA to "operate for a transmission purpose only."[89] Under the MISO proposal, SATA "may only participate in MISO's markets to the extent necessary to receive energy from and inject energy into the transmission system to provide the services for which the [SATA] was included in the [MISO transmission plan] and may not otherwise participate in the energy and operating reserves markets and/or the planning resource auction."[90] FERC accepted the MISO proposal on March 10, 2020, subject to additional proceedings.[91] According to an American Transmission Company Issue Submission Form, MISO will begin a stakeholder proceeding in early 2020 to develop mechanisms "to enable storage as transmission assets to be used to provide market services when available."[92]

SPP has also initiated its own SATA stakeholder proceeding, which will apparently address multi-use ESRs. On January 7, 2020, SPP issued a whitepaper identifying issues that

---

87 *Id*. at 23.

88 California Independent System Operator, Inc., *Revised Draft Policy Initiatives Catalog*, 17 (Aug. 15, 2019).

89 *Midcontinent Indep. Sys. Operator, Inc.*, 170 FERC ¶ 61,186, at P 12 (2020).

90 *Id*.

91 *Id*. at P 1.

92 Bob McKee, *Issue Submission Form*, Midcontinent Independent System Operator, Inc. (Nov. 26, 2019), available at: https://www.misoenergy.org/stakeholder-engagement/issue-tracking/using-storage-as-a-transmission-asset-to-provide-market-services/.

need to be resolved to take advantage of the benefits offered by ESRs.[93] The SPP whitepaper identified the following goals:

1. Capitalize on ESRs' flexibility for acting as both generation and transmission.
2. Maximize ESRs' potential for ensuring reliable and cost-effective energy delivery.
3. Develop cost-recovery mechanisms for ESRs used as either transmission or generation, or as both.
4. Create procedures and tariff language to resolve reliability and operational issues that arise when ESRs are used as generation and/or transmission.[94]

SPP acknowledged that "ESRs can serve as an alternative to traditional transmission facilities to resolve short-term reliability issues such as voltage support and congestion."[95] Further, due to "ESRs' flexibility, it may later be determined that an ESR can also provide energy and related services" in addition to transmission services.[96] One issue SPP identified with multi-use ESRs is how to address market revenues for electric storage receiving cost recovery as a transmission asset.[97] Specifically, SPP stated:

> An ESR that is receiving revenues from both energy and transmission may be in an unfair competitive position when transmission revenues, including a rate-of-return, reduce costs of Integrated Marketplace participation. An ESR could either earn a return in excess of the allowed return for a transmission asset

[93] Southwest Power Pool, Inc., *Electric Storage Resources White Paper* (Jan. 7, 2020) ("*SPP Whitepaper*"). The purpose of the whitepaper was to identify issues and, accordingly, does not provide conclusions. *Id*. at 7. The SPP Strategic Planning Committee discussed the whitepaper during its January 15, 2020 meeting and, together with the Markets and Operations Policy Committee, will be developing a framework to address the issues raised in the report to share at its April meeting. Southwest Power Pool, Inc., *The Org Report: February 2020*, available at: https://www.spp.org/documents/61645/2020%2002%20february%20org%20report.pdf.

[94] *SPP Whitepaper* at 3.

[95] *Id*. at 10.

[96] *Id*. at 16.

[97] *Id*. at 14.

("double-dip") or bid into the market at lower than its marginal cost.[98]

IV. THE STATE EXPERIENCE

Recent state policy momentum is driving an increasing regulatory focus on electric storage. A number of states have set specific electric storage procurement targets, including Arizona (3,000 megawatt ("MW") by 2030), California (1,325 MW by 2024), Massachusetts (1,000 MWh by 2025), New York (1,500 MW by 2025 and 3,000 MW by 2030), and New Jersey (600 MW by 2021 and 2,000 MW by 2030).[99] Others are funding demonstration projects to acquire a better understanding of how electric storage can further state policy goals.[100] Motivated, in part, by the signals provided by their legislators, state utility commissions are sorting through the details of incorporating an increasing amount of electric storage, including interconnection rules and integrated resource plans as well as other issues.[101]

More pertinent to this paper, however, is how these state utility commissions address the different revenue streams available for the different services multi-use electric storage can provide. As the following demonstrates, this is a nascent issue for state utility commissions, and concrete decision-making has been limited.

The potential value ESRs provide through the deferral of distribution investments has generally been acknowledged by states, even if the number of approved ESR distribution projects is limited. For example, the Arizona Public Service Company developed the 2 MW, 8

---

98 *Id*. Similarly, SPP raised concerns that an ESR that is used for resource adequacy and also recovers its costs through transmission rates may be assigning costs attributable to resource adequacy to transmission customers who don't receive that benefit. *Id*. at 17.

99 Environmental and Energy Study Institute, *supra* note 28.

100 Jeremy Twitchell, *A Review of State-Level Policies on Electrical Energy Storage, Current Sustainable/Renewable Energy Reports* 6, 38 (2019).

101 *See, e.g.*, K&L Gates, *supra* note 26, at 26-50 (reviewing the ESR laws, regulations, and policies of states).

megawatt-hour ("MWh") Arizona Punkin Center battery system, which went into operation in 2018, in lieu of rebuilding 17 miles of distribution lines.[102] ESRs also participate in energy markets, such the 2 MW Vaca-Dixon and 4 MW Yerba Buena battery storage systems Pacific Gas & Electric Company ("PG&E"), which were the first ESRs to participate in CAISO's markets.[103] However, it does not appears that any multi-use ESRs are currently in operation, although, as elaborated below, such projects are being planned for the future. The following sections will first address the guidance provided by state utility commissions on multi-use ESRs and then will review examples of planned multi-use ESR projects in these states to add further detail of how these projects expect to monetize the ESR value stack.

a. State Commission Consideration of Multi-Use ESRs

In the limited occasions that ESRs have been considered by states in utility planning, approaches have been mixed. On one extreme is Texas, where utilities are forbidden by law from owning ESRs and the Public Utility Commission of Texas ("PUCT") initially rejected an application submitted by AEP Texas, Inc. to install $1.6 million of electric storage in lieu of an expansion to its distribution system that would cost $6 million to $17 million.[104] In contrast, as explained below, several states and their commissions are considering how to realize the full

---

[102] Brenda Chew, et al., *Non-Wires Alternatives*, Smart Electric Power Alliance, Peak Load Management Alliance, and E4TheFuture, 42 (November 2018), available at: https://e4thefuture.org/wp-content/uploads/2018/11/2018-Non-Wires-Alternatives-Report_FINAL.pdf.

[103] Pacific Gas and Electric Company, *EPIC Final Report* (Sept. 13, 2016), available at: https://www.pge.com/pge_global/common/pdfs/about-pge/environment/what-we-are-doing/electric-program-investment-charge/PGE-EPIC-Project-1.01.pdf.

[104] *Application of AEP Texas North Company for Regulatory Approvals Related to the Installation of Utility-Scale Battery Facilities*, Docket No. 46368, Order, 4 (PUCT, Feb. 15, 2018). While the PUCT initiated a rulemaking to explore this issue further, no action has been taken in that docket since initial comments and reply comments. *See Rulemaking to Address the Use of Non-Traditional Technologies in Electric Delivery Service*, Docket No. 48023.

capabilities of ESRs by enabling these resources to provide both grid services and market services and to be duly compensated.

i. New York

Public Service Law §74 directed the New York Public Service Commission ("PSC") to establish the state's ESR procurement goals and associated deployment policy. Among the list of statutorily prescribed considerations for this deployment policy was "avoided or deferred costs associated with transmission, distribution, and/or generation capacity" and "cost-effectiveness."[105] Pursuant to this statutory directive, the New York PSC issued a decision on December 13, 2018 ("Storage Order"), which directed New York utilities to issue Requests for Proposals ("RFPs") for ESRs developed by competitive bidders.[106] The ESRs would be developed and owned by the competitive bidders, but operated by the utilities. According to the New York PSC, the ESRs could provide the following services "(1) local reliability services; (2) local load relief; (3) local environmental benefits derived by reducing use of peaking units for contingency purposes; and, (4) wholesale services."[107] Recognizing the risks and rewards inherent in forecasting market revenues, the New York PSC permitted competitive bidders to

---

105 N.Y.P.S. Law §74(2).

106 *In the Matter of Energy Storage Deployment Program*, Case 18-E-0130, Order Establishing Energy Storage Goal and Deployment Policy (N.Y.P.S.C., Dec. 13, 2018) ("*NY Storage Order*"). The New York PSC prefers competitively procured ESRs, but explained that utility ownership may be permissible where ESRs on the utility's system that "will be used to support and enhance reliable system operations." Reforming the Energy Vision, Case 14-M-0101, Order Adopting Regulatory Policy Framework and Implementation Plan (N.Y.P.S.C., Feb. 26, 2015) ("*REV Framework Order*"). In the REV Framework Order, the New York PSC delineated the circumstances in which utility ownership would be considered, including where: "(1) procurement of DER has been solicited to meet a system need, and a utility has demonstrated that competitive alternatives proposed by non-utility parties are clearly inadequate or more costly than a traditional utility infrastructure alternative; (2) a project consists of energy storage integrated into distribution system architecture; (3) a project will enable low or moderate income residential customers to benefit from DERs where markets are not likely to satisfy the need; or (4) a project is being sponsored for demonstration purposes." *NY Storage Order* at 43 (*citing REV Framework Order* at 70).

107 *NY Storage Order* at 54.

retain at least a portion of the market revenues received by the ESRs in exchange for the anticipated savings associated with competitive bids.[108]

The New York PSC also specifically addressed "dual participation" for ESRs, a related, but not quite synonymous, concept to multi-use ESRs.[109] Dual participation refers to the distributed energy resources, including distributed multi-use ESRs, that provide separate and distinct services to the utility and the market.[110] In regard to such dual participation resources, the New York PSC forbid unreasonable prohibitions or restrictions on providing multiple services, mandated that reliability services must receive priority, and proscribed double recovery for the same service.[111]

ii. California

California was an early mover on promoting ESRs, adopting a 1,325 MW by 2020 electric storage procurement target in 2013.[112] On January 11, 2018, the California Public Utilities Commission ("CPUC") issued a Decision that adopted 11 rules for "multiple-use"

---

[108] *Id*.

[109] *Id*. at 96.

[110] *Id*. The New York ISO defines dual participation as "the simultaneous enrollment of an individual resource, to provide services to the [New York ISO]-administered wholesale markets and to another entity (e.g., utility or host facility)." New York Independent System Operator, *Distributed Energy Resources Market Design Concept Proposal*, 27 (December 2017). Dual participation therefore includes, but is not limited to, multi-use ESRs.

[111] *NY Storage Order* at 99-100.

[112] *Order Instituting Rulemaking Pursuant to Assembly Bill 2514 to Consider the Adoption of Procurement Targets for Viable and Cost-Effective Energy Storage Systems*, Rulemaking 10-12-007, D.13-10-040, 2 (C.P.U.C., Dec. 16, 2010). The California ESR procurement program is guided by three purposes:

1. Optimization of the grid, including peak reduction, contribution to reliability needs, or deferment of transmission and distribution upgrade investments;
2. The integration of renewable energy; and
3. The reduction of greenhouse gas emissions to 80 percent below 1990 levels by 2050, per California's goals.

Id.

ESRs.[113] The CPUC acknowledged that "current market rules (*i.e.*, utility standard contracts and program tariffs) do not support the ability of an energy resource to access, or 'stack,' more than one service, including any incremental values to the wholesale market, distribution grid, transmission system, resource adequacy requirements and customers."[114] The purpose of the 11 rules, according to the CPUC, was "to promote the ability these storage resources to realize their full economic value when they are capable of providing multiple benefits and services to the electricity system."[115] In the context of Rule 4, the CPUC explicitly provides that ESRs, whether interconnected to the distribution system or the transmission system, may provide both grid and market services.[116] Like the New York PSC, the CPUC's rules for multi-use ESRs forbid double recovery and require that an ESR that provides reliability service must prioritize this service above other services (*e.g.*, market services).[117]

iii. Maryland

In 2019, Maryland passed legislation directing distribution utilities to solicit and apply for Maryland PSC approval of between five to ten megawatts of electric storage projects to be operational by February 28, 2022.[118] The bill, SB 573, provided that the ESRs would first provide grid and reliability services and then market services when not providing grid and

---

[113] *Order Instituting Rulemaking to consider policy and implementation refinements to the Energy Storage Procurement Framework and Design Program (D.13-10-040, D.14-10-045) and related Action Plan of the California Energy Storage Roadmap*, Rulemaking 15-03-011, D.18-01-003 (C.P.U.C., Jan. 17, 2018) ("*11 Rules Order*"). The CPUC considers multiple-use ESRs to be "those that provide multiple services to different entities or jurisdictions." *Id*. at 5.

[114] *Id*. at 9.

[115] *Id*. at 2.

[116] *Id*. at 11.

[117] *Id*. at 11-12.

[118] Md. Code, Pub. Util. § 7-216(b).

reliability services and delineated several potential business models for project applications: 1) utility ownership and operation of the ESRs; 2) third-party ownership and operation, with the utility contracting for grid services; and 3) utility ownership and operation for grid services and third-party operation for market services.[119] Project applications in response to the SB 573 solicitations must estimate the "funds expected to be received from wholesale market transactions" and "the value of any distribution investment deferral or replacement due to the project."[120] When evaluating applications, the Maryland PSC must consider, *inter alia*, the value provided by deferral of transmission investments, funds generated by wholesale markets, and whether the ESRs capture multiple value streams.[121]

On August 23, 2019, the Maryland PSC issued an Order directing 1) the investor-owned utilities to solicit electric storage projects in accordance with SB 573 and 2) an Energy Storage Working Group to develop a "detailed list of the types of value streams each project application should consider."[122] Among the value streams identified by the Working Group in response was avoided investment in the distribution grid.[123] The Working Group identified two monetizable

---

119 Md. Code, Pub. Util. § 7-216(c)(1)-(3). These business models were originally presented to the Maryland PSC on January 14, 2019 (revised on May 15, 2019) by the Energy Storage Working Group in a "Proof of Regulatory Concept Program to test innovative regulatory and business models for energy storage that have the potential to reduce ratepayer costs and provide benefits to customers, utilities, competitive storage providers, and the electric grid." *Proof of Regulatory Concept Program*, PC 44, 6 (Md.P.S.C., May 15, 2019). The legislation also provided a fourth business model, virtual power plants, which are aggregated distributed ESRs and not relevant to this paper. Md. Code, Pub. Util. § 7-216(c)(4).

120 Md. Code, Pub. Util. § 7-216(e).

121 Md. Code, Pub. Util. § 7-216(k).

122 *In the Matter of Transforming Maryland's Electric Distribution System to Ensure that Electric Service is Customer-Centered, Affordable, Reliable and Environmentally Sustainable in Maryland, In the Matter of the Maryland Energy Storage Pilot Program*, PC 44, Case No. 9619, Order No. 89240, 6 (Md.P.S.C., Aug. 23, 2019).

123 *In the Matter of Transforming Maryland's Electric Distribution System to Ensure that Electric Service is Customer-Centered, Affordable, Reliable and Environmentally Sustainable in Maryland, In the Matter of the Maryland Energy Storage Pilot Program*, PC 44, Case No. 9619, Submission of the PC 44 Energy Storage Working Group, 6 (Md.P.S.C., Dec. 31, 2019).

value streams for distribution – avoided or deferred transmission and distribution upgrades and "optionality," a term that was used to refer to the flexibility provided by ESRs to address changing needs of the electric system over time.[124] The Working Group also recognized that ESRs "may be able to achieve revenues from the wholesale market", but that any such revenues would depend on the market participation rules of the relevant RTO/ISO.[125]

b. Multi-Use Storage Competitive Solicitations and Projects

Consistent with state law, and pronouncements by their respective state utility commissions, utilities in New York and California are proceeding with multi-use ESR projects. While no such projects are currently operational, the details of the plans show the utilities' intention to realize the full capabilities of ESRs. These plans would provide value to customers by procuring grid solutions at reduced costs due to market revenue.

i. New York

As required by the New York PSC's Storage Order, on February 11, 2019 Consolidated Edison Company of New York, Inc. ("ConEd")[126] and Orange and Rockland Utilities, Inc. (collectively, the "ConEd Utilities") submitted their joint Implementation Plan for a Competitive

---

124 *Id*. at 7. The Working Group calculated the monetizable value provided by these two value streams as follows: 1) avoided or deferred transmission and distribution upgrades = [PV of cost of the value of traditional investment during the life of the battery storage project] - [PV of battery storage project cost during the life of the battery storage project + any incurred traditional T & D costs] and 2) optionality value of storage = expected value (needed infrastructure investment) – cost of the storage solution. The Working Group also provided a third value stream, hosting capacity, for which no recommendation for calculating the monetary value was provided. Hosting capacity is meant to refer "to the amount of DERs that can be accommodated on the distribution system at a given time and at a given location under existing grid conditions and operations, without adversely impacting safety, power quality, reliability or other operational criteria, and without requiring significant infrastructure upgrades." *Id*. at 15-16.

125 *Id*. at 10.

126 ConEd serves New York City and is the largest electric distribution utility in New York. Consolidated Edison Company of New York, Inc., *Company Information*, available at: https://www.coned.com/en/about-us/company-information (last visited Apr. 27, 2020).

Direct Procurement of Scheduling and Dispatch Rights from Qualified Energy Storage Systems.[127] The ConEd Utilities issued a joint RFP for directed procurement of 300 MW and 10 MW, respectively, of dispatch rights from ESRs on July 15, 2019, modified on August 23, 2019.[128] Under the New York approach, the utilities do not directly procure the storage assets. Instead, they make contractual payments to successful bidders for the right to dispatch the ESR.[129] The payments enable successful bidders to bring the storage facilities into commercial operation.[130]

Under the terms of the Implementation Plan and RFP, competitive bids are to be assessed on both quantitative and qualitative scores.[131] The quantitative score is the sum of market revenue, benefits to the distribution system,[132] and environmental benefit, less the contract payments.[133] When not utilizing the ESR for grid services, the ConEd Utilities will bid the ESRs

---

127 *In the Matter of Energy Storage Deployment Program*, Case 18-E-0130, Implementation Plan of Consolidated Edison Company of New York, Inc. and Orange and Rockland Utilities, Inc. for a Competitive Direct Procurement of Scheduling and Dispatch Rights from Qualified Energy Storage Systems (N.Y.P.S.C., Feb. 11, 2019) ("*ConEd Implementation Plan*").

128 Consolidated Edison Company of New York, Inc. and Orange and Rockland Utilities, Inc., *Request for Proposals*, 1 (1st Revision, Aug. 23, 2019) ("*ConEd RFP*"), available at: https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/bulk-energy-storage/bulk-storage-request-for-proposals.pdf?la=en.

129 *NY Storage Order* at 53-54.

130 Bidders retain ownership and operational control of the ESR, but the ConEd Utilities will bid the ESR into the market and the bidder must operate the ESR in accordance with schedules established by the ConEd Utilities and the market administrator. *ConEd RFP* at 3.

131 *Implementation Plan* at 8. First among qualitative factors is location, with the ConEd Utilities providing a map of "Preferred Load Areas." *ConEd RFP* at 11. The other qualitative factors are: project viability, credit quality, adherence to terms, system design, bidding team experience, safety, and bidder concentration. *Id*. at 11-12.

132 More specifically, Distribution benefits are "quantifiable benefits associated with a storage system's location in the [ConEd] and/or O&R distribution system." *Id*. at 10-11.

133 *Id*. at 10.

into the markets of the New York Independent System Operator ("New York ISO"), receive the market revenue, and pay any market charges and the costs to charge the ESR.[134]

Market revenue will be shared between the bidder, customers of the ConEd Utilities, and, potentially, the shareholders of the ConEd Utilities.[135] Initially, market revenue is shared between the bidder and customers.[136] The ConEd Utilities will recover their contract payments to bidders through a surcharge[137] and the customers' share of the revenues will be credited against this surcharge.[138] To the extent the customer share of revenues exceeds contract payments, the excess "will be split on a 70/30 basis" between customers and ConEd shareholders.[139] Bidders are instructed to consider potential market revenue when determining proposed contract payments.[140]

Separate from its procurement pursuant to the New York PSC's Storage Order, ConEd is also pursuing a Commercial Battery Storage Demonstration Project under New York's Reforming the Energy Vision ("REV"). The objective of the REV demonstration projects is to "demonstrate new business models, *i.e.* new revenue stream opportunities for third parties and utilities."[141] Utilities are permitted to recover the costs incurred as a result of these

---

[134] *ConEd Implementation Plan* at 13.

[135] *Id*. at 13-14.

[136] *Id*.

[137] *Id*. Ultimately, these contract payments will be included in the rate base of the ConEd Utilities, thereby not only recovering the contract payments, but also receiving a return on those payments from ratepayers. *Id*. at 12.

[138] *Id*. at 13.

[139] *Id*. at 14.

[140] *ConEd RFP* at 4 ("It is strongly recommended that Bidders consider the value of market participation and all potential revenue sources for the energy storage Project in the post-Agreement period when determining an Offer Price.").

[141] *REV Framework Order* at 115.

demonstration projects through rates.[142] The ConEd demonstration project in partnership with GI Energy "to demonstrate how distributed, front of the meter ("FTM") energy storage can provide transmission and distribution . . . support, earn wholesale market revenues, and increase the market size of participating customers by aligning the interests of [ConEd], customers, and third-party developers."[143]

The project will consist of four distribution interconnected batteries totaling 4.2 MW and 4.4 MWh that will be developed by GI Energy and located on the properties of ConEd customers.[144] The value provided by the project will be lease payments to the customer for the use of its site, transmission and distribution deferral for ConEd, and market revenue when the project is not providing transmission and distribution services that GI Energy will share with ConEd.[145] As market revenues for the project are uncertain at this time, ConEd is supporting the financing of the batteries.[146] However, ConEd anticipates that it will only pay "for the portion of the battery used for [transmission and distribution] benefit" for future projects under this business model.[147] Accordingly, ConEd "will be able to lower cost of service for customers while enabling an increase in battery installations."[148] Although not applicable to this pilot

---

142 *Id*. at 116.

143 *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision*, Case 14-M-0101, REV Demonstration Project Quarterly Report Q4 2019, 3 (N.Y.P.S.C., Jan. 31, 2020).

144 *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision*, Case 14-M-0101, REV REV Demonstration Project Outline, 7 (N.Y.P.S.C., Jan. 20, 2017) ("*REV Project Outline*").

145 *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision*, Case 14-M-0101, Reforming the Energy Vision Demonstration Project Assessment Report, 7 (N.Y.P.S.C., May 18, 2017).

146 *REV Project Outline* at 22.

147 *Id*. at 8.

148 *Id*.

project, in the future, ConEd expects to use a competitive process to select the lowest cost electric storage projects to meet ConEd's needs.[149]

ii. California

In its 2016 Energy Storage Plan Decision, the CPUC approved the 2016 ESR procurement plans of PG&E and Southern California Edison ("SCE") and authorized PG&E and SCE to explore innovative use cases to include in the 2016 solicitations, including electric storage that can facilitate distribution deferral.[150] Among the projects submitted in response by PG&E was the Llagas Energy Storage project, a 20 MW lithium ion battery to be interconnected with the distribution grid.[151] The Llagas project would be designed and constructed by Tesla, Inc., but would ultimately be owned and operated by PG&E pursuant to a Purchase and Sale Agreement.[152] Under the Purchase and Sale Agreement, the Llagas project would "maintain distribution reliability, participate in CAISO markets, and contribute to PG&E's satisfaction of its [Resource Adequacy] requirements", with priority given to the reliability services.[153] PG&E would recover the costs of the Llagas project through distribution rates and the market revenues will be flowed back to customers, reducing the cost of the storage project.[154]

The California Office of Ratepayer Advocates raised several arguments against approval of the Llagas project, including that it was inconsistent with the CPUC's 11 rules for multi-use

149 *Id*. at 12.

150 *Application of Southern California Edison Company (U338E) for Approval of the Results of Its 2016 Energy Storage and Distribution Deferral Request for Offers, And Related Matter*, A.17-12-002, A.17-12-003, D.18-10-009, 3 (C.P.U.C., Oct. 19, 2018).

151 *Id*. at 25.

152 *Id*.

153 *Id*. at 18, 25.

154 *Id*. at 30-31.

ESRs and was not cost-effective compared to alternatives.[155] The CPUC found that the Llagas project satisfied its 11 rules, as PG&E committed "to prioritize the Llagas capacity for its intended distribution reliability service."[156] Further, the project was found to be cost-effective because "when not only capital costs, but also expected market revenues, are taken into account, the Llagas project was one of the most economically viable projects among offers submitted in the PG&E's 2016 Energy Storage and Distribution Deferral [Request for Offers]."[157]

V. MULTIPLE USE ESRs LESSONS LEARNED FROM REGULATORY PROCEEDINGS

Universally, regulators recognize the potential for ESR transmission and distribution deferral projects to reduce the costs ultimately borne by utility customers through market revenues. For example, the New York PSC anticipates that competitively-bid storage solutions will incorporate savings resulting from market revenue and, in considering the PG&E Llagas project, the CPUC found that ESRs provide a cost-effective alternative to traditional grid solutions when market revenues are included.

However, a single asset operating as both a market participant and a transmission and distribution deferral project raises several novel issues, and the decisions and planned projects described above provide a number of lessons that can inform the optimal path forward for multi-use ESRs. First and foremost, a multi-use ESR must provide priority to transmission and reliability services ahead of market services. This is one of the principles established in FERC's

---

[155] *Id*. at 17, 25-26.

[156] *Id*. at 18.

[157] *Id*. at 26. The CPUC also granted PG&E's requested cost recovery mechanism set forth in the Llagas electric storage Purchase and Sale Agreement. Id. at 35. However, the CPUC cautioned that its approval is not precedential for future multi-use applications, including distribution deferral electric storage contracts. *Id*. The CPUC also said that its approval was subject to modification in the future, when it adopts a uniform policy for cost recovery for multi-use ESRs or distribution deferral electric storage contracts. *Id*.

Policy Statement and nearly all other jurisdictions addressed above agree. For example, reliability and distribution services are required to receive priority under the New York PSC's Storage Order and the CPUC's 11 rules for multiple-use ESRs. Second, operational control should rest with a market participant, either the utility or a third-party operator, and should not be the responsibility of the market administrator, namely the RTO/ISO. This principle also stems directly from the FERC Policy Statement in recognition of the conflict that could arise if a market administrator also acts as a market participant.

Third, in order to incentivize efficient market participation, the market participant should retain at least a portion of the market revenue. The necessity for such a profit motivation is recognized in New York, where the utilities' RFP shares revenue with both the utility, which will be bidding into the market, and the bidder, which will be maintaining the ESR. A must-offer obligation, as considered by CAISO, is an arbitrary administrative remedy that is inconsistent with efficient market principles. For PG&E's Llagas project, it appears that all market revenue will be flowed back to customers and, consequently, it is not clear what motivation PG&E would have to fully develop the market capabilities of that project.

Finally, it appears that many states prefer competitive procurement of multi-use ESRs, compared to ESRs that are developed and owned by incumbent utilities without soliciting third-party proposals under a competitive process. There are several compelling justifications for this preference.

First, competitive procurements of multi-use ESRs benefit consumers by driving down the cost of ESRs. Specifically, assuming the bidder submits a single price for the ESR, without any explicit provision for sharing market revenues, bids are implicitly reduced by the bidders' expectation of future market revenues. Even if an explicit sharing mechanism is incorporated into the RFP, the bidder would still reduce its bid price to the extent of the ESR's total anticipated revenues multiplied by its revenue share. The point is clear: in either case, the risk that market revenue is not ultimately realized is shifted from customers to bidders.

Second, competitive bids also avoid the need for regulators to administratively determine appropriate cost recovery for transmission assets, and how future market revenues need to be accounted for in determining the total revenue for the ESR. While regulators might be adept at determining an appropriate cost-of-service rate, they would be placed at a severe disadvantage compared to the storage owner in forecasting market revenues, which depend both on ESR functionality and bidding strategy, factors that are especially susceptible to information asymmetries. The danger, of course, is the provision of significant rents to the storage owner, far above the just and reasonable rate.[158]

VI. PATH FORWARD FOR MULTIPLE USE ESRs: DETERMINING TRANSMISSION AND DISTRIBUTION VALUE THROUGH COMPETITION

a. Competitive Procurement Under FERC Order No. 1000

While states have indicated a preference for competitive procurement of multi-use ESRs at the distribution level, multi-use ESRs at the transmission level appear to be trending towards a more traditional cost-of-service model. However, FERC’s rules provide an under-utilized path towards competitive procurement of multi-use ESRs, which would drive more efficient and economic outcomes and mitigate FERC’s concerns related to double recovery and market price suppression.

[158] David P. Brown & David E.M. Sappington, *Motiving the optimal procurement and deployment of electric storage as a transmission asset*, Energy Policy, 9 (2019).

Through Orders 890 and 1000, FERC brought competition and independent transmission development into transmission planning.[159] These Orders, in particular Order No. 1000, required public utility transmission provider participate in a regional transmission planning process that eliminated the Federal right of first refusal for certain new transmission facilities, which allowed incumbent utilities to have the first right to build new transmission lines.[160] FERC explicitly allowed public utility transmission providers to use competitive solicitations,[161] but rejected "suggestions to mandate a competitive bidding process for selecting project developers."[162]

Since Order No. 1000, competitive transmission projects have made up a small, but demonstrably cost-effective, proportion of the total transmission projects. According to a 2019 Brattle Group study, of the $75.9 billion of total transmission investments over the prior five years, only three percent were dedicated to 31 competitively-bid transmission projects.[163] However, for these competitively-bid transmission projects, winning bids average 40 percent below initial cost estimates, while non-competitive projects were completed at 34 percent above initial estimates.[164] Although winning bids and final project costs are not a perfect comparison,

---

159 *See* Melissa Powers, *Anticompetitive Transmission Development and the Risks for Decarbonization*, 49 Envtl. L. 885, 925 ("FERC had found in Order No. 1000 that independent transmission development would result in adequate, reliable, and cost-effective service, and a competitive bidding process would create a fair transmission development process that would minimize disputes.")

160 *FERC Order No. 1000*, at P 6.

161 *Id*. at P 259.

162 *Id*. at P 321, n 302

163 Johannes P. Pfeifenberger, et al., *Cost Savings Offered by Competition in Electric Transmission*, The Brattle Group, 5, 16, 26 (April 2019) ("*Brattle Study*"), available at: https://brattlefiles.blob.core.windows.net/files/16726_cost_savings_offered_by_competition_in_electric_transmission.pdf.

164 Johannes Pfeifenberger, et al., *Transmission Competition Under FERC Order No. 1000 at a Crossroads: Reinforce or Repeal?*, Presentation to American Public Power Association, The Brattle Group, 12-13 (Oct. 10, 2018), available at: http://files.brattle.com/files/14669_transmission_competition_under_ferc_order_no__1000_at_a_crossroads_-_reinforce_or_repeal.pdf.

the competitively-bid transmission projects generally include cost caps or cost controls, reducing the risk and magnitude of cost escalations.[165]

A multi-use ESR that is part of a successful competitive transmission project package should be able to retain any additional market revenue without a corresponding reduction in its cost-of-service. Allowing the ESR owner to determine its revenue requirement through the bid provides the owner with the flexibility to estimate a reasonable market revenue expectation, while insulating customers from market risk. If the ESR bid is successful against competing transmission projects, customers again benefit by receiving a transmission solution at a reduced cost due to the supplemental market revenues. Market administrators will benefit by avoiding the additional administrative burdens needed to determine a partial cost recovery and revenue sharing mechanism for the multi-use ESR. Further, the ESR owner will also benefit by avoiding these administrative burdens and will additionally be able to stack uncertain market revenue on top of stable and predictable transmission revenue.

Establishing the costs attributable to the transmission services provided by ESRs through a competitive approach will address the concerns and goals espoused by FERC in its Policy Statement.[166] First, allowing the ESR owner to retain market revenues will provide appropriate

---

[165] *Brattle Study* at 30. None of the competitively-bid projects identified during the five-year period have been completed. However, the one competitive project that has been completed, the Path 15 Upgrade project, was completed on time and at a cost 18 percent less than the estimate by the incumbent transmission owner. *Id*. at 44.

[166] In its Policy Statement, FERC recognized that market participation for resources that receive cost recovery through cost-of-service rates has already been permitted in several cases. *FERC Policy Statement* at P 22. For instance, generation resources that participate in energy markets may also receive cost-based recovery for reactive power services. *Id*. Further, vertically-integrated utilities that own generation resources for which the utility receives cost-based rate recovery may enter the generation resources into market. *Id*. In these instances, revenues are fully or partially credited back to customers based on the principle that these customers have paid for the resource and, therefore, should receive the benefit of any resulting revenues. *See Sw. Pub. Serv. Co.*, 49 FERC ¶ 61,296, at 62,133 (1989) ("Firm customers are allocated in their rates the full costs of the utility's generating and transmission system. It is only appropriate then that these same firm customers receive a 100% credit when non-firm customers pay the utility to use the same system."). FERC has also allowed partial recovery of market revenue when a utility acknowledged that, without this revenue, the utility would lack

motivation to ensure “that the full capabilities of [the ESR is] realized, thereby maximizing [its] efficiency and value for the system and to consumers.”[167]

This approach will also avoid double recovery because the ESR bid will account for potential market revenues. A successful bid demonstrates that these costs attributable to the transmission services provided by the ESR are just and reasonable, as it will be in consistent with or below the costs of other transmission options. As stated by CAISO: “Since the market revenues are separate from the [transmission revenue requirement] determination and received for providing a separate service, they do not constitute double recovery cost so long as the resource owner bears any additional maintenance costs incurred from voluntary market participation.”[168]

The competitive approach also mitigates concerns that the ESRs' participation in the market will inappropriately suppress market prices. FERC is generally concerned about resources that receive out-of-market payments bidding into the markets at lower than competitive prices.[169] However, ESRs under the model proposed in this paper do not receive a subsidy of the

---

incentive to make market sales for the benefit of customers. *Constellation Mystic Power, LLC*, 165 FERC ¶ 61,267, PP 113, 133 (2018). In contrast to FERC’s precedent regarding market participation of generation, the costs of which have been fully assigned to customers, the recoverable transmission costs for competitively procured ESRs would be reduced to account for market revenue. While this precedent demonstrates that resources may both receive cost-of-service rates and participate in FERC-jurisdictional markets, it should not preclude ESRs providing competitively-procured transmission services from also retaining market revenue.

167 *FERC Policy Statement* at P 2. Although simple, CAISO’s proposal for the ESR owner to receive the full costs of the ESR through a transmission revenue requirement and credit any market revenue to transmission ratepayers lacks an incentive for the owner to offer the ESR services into the market, and thus maximize the full capabilities of the ESR.

168 *CAISO Straw Proposal* at 18.

169 *See, e.g., PJM Interconnection, L.L.C.*, 163 FERC ¶ 61,236 at P 155 (*citing ISO New England Inc.*, 135 FERC ¶ 61,029, at PP 170-71 (2011)) (finding that state support for specific resources, *i.e.*, carbon-free electricity generation, inappropriately suppressed the prices in the PJM Interconnection capacity market); *see also* Robbie Orvis & Mike O’Boyle, *It’s Time to Refine How We Talk About Wholesale Markets*, Greentech Media (Feb. 12, 2018), available at: https://www.greentechmedia.com/articles/read/its-time-to-refine-how-we-talk-about-wholesale-markets.

kind that has typically troubled FERC. Rather, the ESRs will receive a competitively-established payment, reduced to account for market revenues, for a service that is distinct from those that are provided in the market. This delineation of services would be reinforced by a competitive solicitation that sets the parameters of control by the RTO/ISO for the provision of transmission services, while vesting control of the market services with the ESR owner.

As noted by NextEra in comments to FERC, unlike subsidies for renewable or nuclear electricity generation, which are explicitly limited to certain resources, all resources, including other market participants, may submit an offer in response to a competitive transmission need.[170] Further, resources that receive cost-based recovery, including generation owned by vertically integrated utilities, are already participating in RTO/ISO markets.[171]

b. Competitive Procurement in CAISO's Transmission Planning

CAISO provides an illuminating example of how competitive procurement fits into transmission planning and how multi-use ESRs may be considered in this process. CAISO's transmission planning follows three phases – Phase 1 results in a plan to study transmission needs, Phase 2 identifies those needs results in a comprehensive transmission plan, including possible non-transmission alternatives, and a competitive procurement is held in Phase 3 for transmission needs that qualify for the competitive process.[172] Qualifying transmission needs include those intended to provide reliability, policy, or economic transmission solutions, except

---

170 *Utilization in the Organized Markets of Electric Storage Resources as Transmission Assets Compensated Through Transmission Rates, for Grid Support Services Compensated in Other Ways, and for Multiple Services*, Docket No. AD16-25-000, Post-Technical Conference Comments of NextEra Energy Resources, LLC, 9 (Dec. 14, 2016).

171 *Id*.

172 *CAISO Straw Proposal* at 39.

for upgrades to existing facilities.[173] According to CAISO, the competitive procurement "considers two things (1) does the project address the identified need, and (2) what is the cost of the project compared to other alternatives."[174] In its Second Straw Proposal, CAISO includes competitive procurement in option two of its proposal, which would provide partial cost-of-service to the multi-use ESR and allow the owner to retain the market revenues.[175] However, CAISO considered eliminating this option because uncertain market revenues may impede financing.[176]

It is possible that, initially, the risk inherent in forecasting uncertain market revenues may negate the any cost-of-service benefit, but this would represent an appropriate allocation of risk that will be addressed in the competitive bidding process. If the bidder is unable to rely on any market revenues, the bid will have to compete without any reduction. If the bid still proves to be the most economic option, the ratepayer is not harmed if those market revenues ultimately materialize. Over time, as market revenues for ESRs become reliable, the financial risks will diminish and the bid prices will be reduced in the face of competition, to the benefit of consumers. If anything, this demonstrates the elegance of competitive procurement, in which the onus of predicting future market revenue, and the risk those revenues don't materialize, falls on the ESR owner, and the competitive process ensures that only an economic solution is selected even if those predicted market revenues are negligible.

VII. CONCLUSION

[173] *Id*. at 42. Local transmission projects do not qualify for the competitive process.

[174] *Id*. at 22.

[175] *Id*.

[176] *Id*.

As declared by FERC, rules for multi-use ESRs should strive to maximize the full capabilities of these resources, while protecting consumers from paying for excessive costs. Striking this balance raises several issues that have been recognized across jurisdictions, including prioritizing grid services, preventing double recovery, mitigating market price suppression, and incentivizing operators to maximize the full capabilities of the ESR. Although regulatory consideration of multi-use ESRs is at its nascency, some principles are already receiving universal recognition, such as prioritizing grid services, and states appear to trending towards competitive procurement of multi-use ESRs as an efficient means to establish a cost for transmission and distributions services, evaluate future market revenues, provide appropriate incentives, and avoid double recovery and price suppression. A route to adopt this approach exists at the federal level as well under FERC's Order No. 1000, and RTOs/ISOs should consider the benefits of competitive procurement when developing their rules for multi-use ESRs.

However, to make the competitive approach effective for ESRs and the grid in general, several additional steps should be taken. First, competitive procurement of transmission solutions must be expanded. For example, according to the Brattle Study, the limited number of competitive transmission procurements is due, in part, to overly restrictive rules placed on competition by RTOs/ISOs in regional planning. In addition, FERC's Order No. 1000 exempts from competition certain transmission projects, such as upgrades to existing transmission facilities.[177] Some RTOs/ISOs have compounded the issue presented by this exemption by applying it broadly.[178] Unfortunately, ESRs may be most suited to address transmission

[177] *FERC Order No. 1000* at P 319

[178] For example, 132 of the 139 transmission projects approved by PJM during the study period were for upgrades to existing facilities. *Brattle Study* at 27.

upgrades, compared to other transmission projects.[179] In order to realize the full benefits of competitive transmission procurement, and ESRs participation in those procurements, the RTOs/ISOs should eliminate needless restrictions and FERC should expand competition to include transmission upgrades.

[179] *See Utilization in the Organized Markets of Electric Storage Resources as Transmission Assets Compensated Through Transmission Rates, for Grid Support Services Compensated in Other Ways, and for Multiple Services*, Docket No. AD16-25-000, Statement of PJM Interconnection, L.L.C., 3 (Nov. 4, 2016) ("The same would hold true for the analysis of electric storage solutions in lieu of a traditional transmission upgrade for those projects which do not go through the Order No. 1000 competitive solicitation process. From a practical standpoint, given the current maturity of battery technology, it is far more likely that electric storage resources would be submitted for consideration by Transmission Owners as they principally would be for lower voltage upgrades on incumbent Transmission Owner facilities. Per Order No. 1000, these types of upgrades are not eligible for competitive solicitation."